

APPENDICES

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APPENDIX A

WATER MANAGEMENT, EROSION AND
SEDIMENT CONTROL FOR CONSTRUCTION AREAS

SAMPLE EROSION, SEDIMENT, AND STORMWATER CONTROL PLAN A-1

Sample Erosion, Sediment, and Stormwater Control Plan

The sample plan has been designed to include all of the items that should be considered when planning for erosion, sediment, and stormwater control. This plan, however, does not by any means contain every best management practice that can be used. Different areas may require different BMPs based on the topography, climate, surface cover, and soils. For illustrative purposes, a number of measures have been used. In reality, further information may be required such as surface and subsurface soil investigations that provide a check on the soil survey.

Determine Grading Limits

Grading limits are indicated by outlining on the plan the extent of all areas where the soil will be disturbed or existing vegetative cover removed exposing bare soil. These areas will require one or more temporary or permanent soil stabilization measures.

Determine Drainage Areas

Outline all separate drainage areas that occur on the site. In the case of the site plan that was prepared (Figure A-1), there are three separate drainage areas as follows:

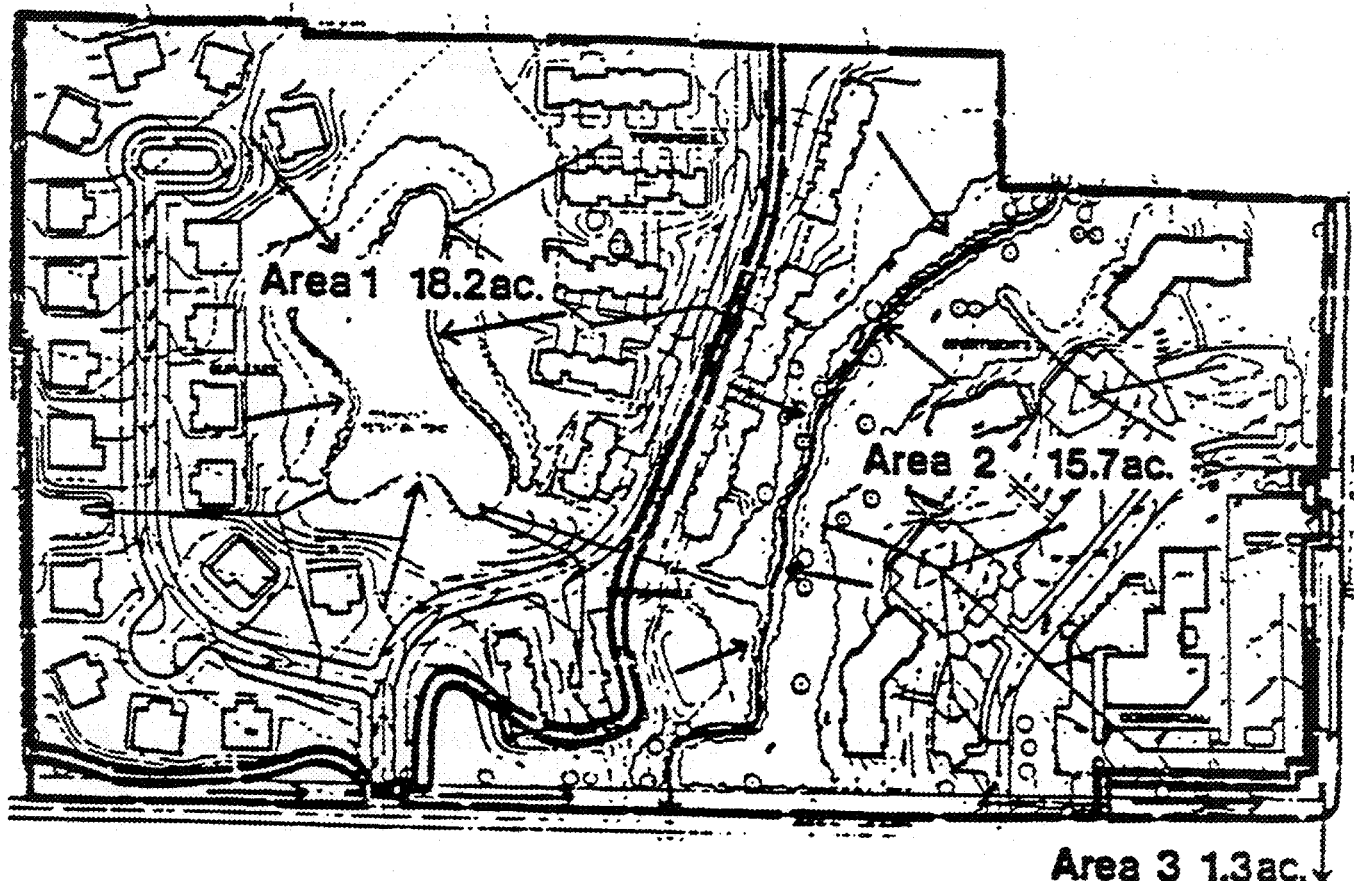
Area 1 - Includes approximately 18.2 acres of the western portion of the site. All stormwater is discharged to the existing pond. Stormwater includes that that falls directly on the areas as well as runoff from adjacent properties to the west. Draw down for the pond is via an enclosed conduit easterly to Willow Creek.

Area 2 - Includes approximately 15.7 acres of the eastern portion of the site. All stormwater is discharged to Willow Creek from both enclosed drainage and overland flow. Since Willow Creek is part of the regional watershed drainage pattern, protection of the creek from sediment deposition is particularly critical.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENT CONTROL PLAN A-2

Area 3 - Includes approximately 1.3 acres of land adjacent to Deerpath Road and portion of Route 31. All stormwater is discharged directly to the roadside drainage ditches, with off-site discharge points on the north and south. The prevention of sediment from entering the drainage ditches is particularly important.



DETERMINATION OF DRAINAGE AREAS FIGURE A-1

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENT CONTROL PLAN A-3

Selection of Specific Control Measures

To develop the most effective erosion control strategy, the three areas of concern, soil stabilization, runoff control, and sediment control, should be evaluated for each drainage area. This evaluation assures the most comprehensive strategy for the entire project. As control measures are selected for each area, their corresponding practice symbols should be placed on the final Erosion, Sediment and Stormwater Control Plan. For the subject site plan, the selection of control measures is made as follows:

Soil Stabilization

1. Topsoil Stockpiling - Strip topsoil from graded areas and stockpile for later use. Stockpiles should be located in safe areas and be adequately protected by temporary seeding and mulching.
2. Temporary Seeding - Certain portions of the project will be rough-graded as a first stage of construction with finish grading to follow near project completion. Seed these areas with fast germinating temporary grasses to reduce erosion potential.
3. Permanent Seeding - Immediately after finish grading establish permanent seeding.
4. Sodding - Sod may be installed in high activity areas such as building entrance zones for immediate stabilization. In Area 3, sod is required on slopes adjacent to the public rights-of-way to prevent sedimentation in the drainage ditches.
5. Paved Areas - All roads and parking areas will be paved. Install the aggregate base as soon as possible in the construction sequence to provide required stabilization. Roads should be paved before other construction is started.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENT CONTROL PLAN A-4

Runoff Control

1. Diversions - In areas 1 and 2 (Figure A-1), construct diversions at the lower end of graded areas to intercept sediment laden runoff and direct it to a controlled discharge point at the creek.
2. Enclosed Drainage - Drain paved roads and parking lots by an underground storm sewer system.
3. Waterways - Construct a lined channel at the outlet of the pond discharge pipe to conduct water to Willow Creek. Construct vegetative channels at the outlets of diversions on the west side of Willow Creek to conduct runoff to the creek.
4. Outlet Protection - Build lined aprons at all storm sewer outlets discharging to the pond area.

Sediment Control

1. Sediment Basins - Construct sediment basins adjacent to the creek in area 2 (Figure A-1). These should be permanent structures designed to receive runoff from the diversion berms.
2. Sediment Barriers - During construction filter sediment laden water through straw bales before it enters storm inlets.
3. Sediment Filters - Provide barriers where surface drainage discharges to the creek or to off-site areas without being treated in a sediment basin. Such drainage areas must be less than one acre. Install a vegetative filter to stabilize the edge of the pond and filter sediment from surface runoff entering the pond.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENT CONTROL PLAN A-4 (Cont'd)

Scheduling Construction Activities

Scheduling of construction activities should include sequence of construction, construction techniques, landscaping, and future operations and maintenance considerations. By properly scheduling the construction, both the extent of exposed ground and the duration of exposure can be minimized. Clear, grade, and stabilize one portion of the site before clearing and grading begin on another portion. Phasing these activities will limit the number and severity of erosion problems.

Construction phased so that a vegetated buffer is above or below critical areas, such as slopes, streambanks, and surface drainageways under construction, will reduce the amount of runoff reaching the critical exposed area. A phased operation is especially valuable in dealing with long slopes and large areas.

WATER MANAGEMENT, EROSION AND SEDIMENT CONTROL FOR CONSTRUCTION AREAS

SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-5

The amount of rainfall and runoff during different periods of the year influences erosion vulnerability. Erosive rains, not rainfall, is the key factor to erosion control. The growing season extends from April to mid-October. The recommended seeding schedule and species for both temporary and permanent seeding during this growing period are given in Chapter 4.

Temperature as well as precipitation, influences seed germination. The cool, moist periods of early spring and fall are the most favorable for establishing a stabilizing vegetative cover. Planting during the late summer and early fall ensures that soil will be well protected from erosion during the high-risk period of the following spring through early summer when erosive rainfall is the greatest. Where feasible, it is recommended that stabilizing vegetation be established in critical areas, such as drainageways and streambanks, before major clearing and grading begin on the rest of the site. The scheduling of site preparation work in the late summer and establishing vegetation over the fall period assures critical areas will be well protected for the period of major construction during the following summer.

When installation of permanent measures are not possible prior to winter shut-down, temporary seeding and mulching should be installed to protect the site during winter and early spring months.

Sequence of control measure installation is a critical factor in controlling erosion and sedimentation on the construction sites. Sediment basins and associated conveyance systems, whether temporary or permanent, should be installed before construction begins on the rest of the site.

Immediately after grading is completed, permanent surface cover should be established. Areas that are to be left for extended periods before they are brought up to final grade and permanently stabilized, should use temporary surface cover and/or mulch to stabilize the exposed soil surface.

Developing the Schedule

The three main items required are a construction sequence, soil protection chart, and an inspection and maintenance schedule. This provides a system that will explain what and when it is going to happen.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-5 (Cont'd)

List the construction sequence chronologically.. Each item in the list is a symbol referring to the specific erosion control measures to be used. This construction schedule explains in an orderly fashion what will occur from first to last. This gives plan reviewers and job superintendents a simple explanatory system to demonstrate the sequence of construction items.

WATER MANAGEMENT, EROSION AND SEDIMENT CONTROL FOR CONSTRUCTION AREAS

SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-6

The Soil Protection Chart provides a schedule for seeding, sodding, or mulching. This chart can be used to schedule erosion control activities even if the anticipated construction schedule falls behind.

The type of soil protection measure can be permanent or temporary seeding, sodding, or mulch. Across the top of the soil protection chart are the months of the year. The arrows show the time of year and the type of soil protection to be applied. The seeding mixtures were selected from information given in Chapter 4 and are represented by the letters A through E. In the case of mulch, the letter indicates the type of mulch and rate per acre. For sod, the letter states sod.

TYPICAL SOIL PROTECTION CHART

STABILIZATION TYPE	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Permanent Seeding			A -----*				*	----->				
Temporary Seeding			B -----C				*	----->				
Sodding			D ** ----->									
Mulching	E ----->											

- A = KENTUCKY BLUEGRASS @ 90 LBS/AC. MIXED WITH PERENNIAL RYEGRASS @ 30 LBS/AC.
- B = SPRING OATS @ 100 LBS/AC.
- C = WHEAT OR CEREAL RYE @ 150 LBS/AC.
- D = SOD
- E = STRAW MULCH @ 2 TONS/AC.
- * = IRRIGATION NEEDED DURING JUNE AND JULY
- ** = IRRIGATION NEEDED FOR 2-3 WEEKS AFTER APPLYING SOD

TYPICAL SOIL PROTECTION CHART FIGURE A-2

WATER MANAGEMENT, EROSION AND
SEDIMENT CONTROL FOR CONSTRUCTION AREAS

SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-7

Operation and Maintenance Plan

The final step in construction site planning is the development and implementation of an operation and maintenance plan for all temporary and permanent soil erosion control measures. This written plan should contain information covering the work program, materials, and equipment to be used, parties responsible for the maintenance, and the anticipated schedule of the maintenance program.

Follow-up inspections, immediately after each phase of construction, as well as periodic inspection and maintenance, are necessary to assure the proper functioning of erosion control measures. Runoff conveyance and storage measures and structural measures require inspection after every rain that produces runoff. Any channel obstructions should be removed and any damages repaired immediately. Sediment basins and retention basins may require cleaning out on a regular basis in order to remain effective.

The use of vegetative material for erosion control purposes also requires a regularly scheduled maintenance program. A follow-up maintenance program includes repair of seeded, sodded, or other vegetatively stabilized areas where the desired degree of stabilization has not been achieved. Spring plantings should be inspected during the summer or early fall so that any corrective measures that may be needed can be performed during the fall planting season. Maintenance of common areas in subdivisions is normally assumed by a homeowners' association. This should be considered in planning and designing permanent erosion and sedimentation control structures and practices. By making slopes 4:1 or flatter and designing for low maintenance, mowing and cleaning is more likely to take place, reducing the chance of poor maintenance and resulting structural failures. The operations and maintenance schedule should be written down for future reference by the landowners. If items such as timing, inspections, minor repairs, and grounds maintenance are clearly spelled out, they are more likely to be followed.

WATER MANAGEMENT, EROSION AND
SEDIMENT CONTROL FOR CONSTRUCTION AREAS

SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-8

Checklist

NARRATIVE

Project description - Briefly describe the size, nature and purpose of the land-disturbing activity and the amount of grading involved.

Existing site conditions - A description of the existing topography, vegetation, and drainage.

Adjacent areas - A description of neighboring areas such as streams lakes, residential areas, roads, etc., that might be affected by the land disturbance.

Soils - A brief description of the soils on the site give such information as soil names, mapping unit, erodibility, permeability, depth, texture, and soil structure.

Critical areas - A description of areas on the site that have potential serious erosion problems.

Erosion and sediment control measures - A description of the methods that will be used to control erosion and sedimentation on the site.

Permanent stabilization - A brief description, including specification, of how the site will be stabilized after construction is completed.

Stormwater management considerations - Will the development of the site result in increased peak rates of runoff? Will this result in flooding or channel degradation downstream? If so, considerations should be given to stormwater control structures on the site.

Maintenance - A schedule of regular inspections and repair or erosion and sediment control structures should set forth.

Calculations - Any calculations made for the design of such items as sediment basins, diversions, waterways, and collocations for runoff and stormwater detention, basin design (if applicable).

Construction Sequence.

Name and address of the plan designer and owner.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-9

Checklist (Cont'd)

SITE PLAN

Vicinity map - A small map locating the site in relation to the surrounding area.

Existing contours - The existing contours of the site should be shown on a map.

Existing vegetation - The existing tree lines, grassy areas, or unique vegetation should be shown on a map.

Soils - The boundaries of the different soil types should be shown on a map.

Indicate north - The direction of north in relation to the site should be shown.

Critical erosion areas - Areas with potentially serious erosion problems should be shown on a map.

Existing drainage patterns - The dividing lines and the direction of flow for the different drainage areas and drainageways should be shown on a map.

Final contours - Changes to the existing contours should be shown on map.

Limits of clearing and grading - Areas that are to be cleared and graded should be outlined on a map.

Location of practices - The locations of the erosion and sediment control and stormwater management practices used on the site should be shown on a map.

Detailed drawings - The detailed drawings for the structural practices that will be installed.

Utilities and easements - Show the existing location of buried and overhead utilities and all recorded easements.

Legend - Explain all symbols used.

Scale - Show the scale use on the site plan.

Existing Features - Show location of natural and man-made features, utilities, and easements.

WATER MANAGEMENT, EROSION AND
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SAMPLE EROSION AND SEDIMENTATION CONTROL PLAN A-10

Conclusions

The preparation of a document that graphically illustrates and clearly describes the erosion, sediment and stormwater control measures to be utilized on construction sites is a first step in preventing erosion and sedimentation damage. This plan, when properly implemented, lessens or eliminates the need for remedial erosion control.

Clear, concise documentation of all pertinent site conditions, erosion control measures, timing of construction, keys and legends will result in a site plan that can be implemented, inspected, and maintained.

There are three steps in effective stormwater, erosion, and sedimentation control. The first involves identifying critically erodible areas. This is done by analyzing site conditions and characteristics such as topography, soils, drainage, vegetation, etc. The second step is to determine what types of best management practices are necessary and where they are to be applied. The third step is the development and implementation of an operation and maintenance plan for all permanent practices. This written plan should contain information covering the schedule of maintenance, the extent of work, materials and equipment to be used, and parties responsible for the maintenance.

By using the planning matrix to help plan, apply, and maintain best management practices, development can be accomplished with reduced environmental damage, at minimal extra cost. It can also result in an increased property value for the site.

1. **INSPECTION SCHEDULE**
 1. **PRELIMINARY INSPECTION**: TO BE CONDUCTED AT THE START OF THE PROJECT TO IDENTIFY EXISTING CONDITIONS AND TO ESTABLISH A BASELINE FOR THE PROJECT.
 2. **CONSTRUCTION INSPECTION**: TO BE CONDUCTED AT REGULAR INTERVALS DURING THE CONSTRUCTION PHASE TO MONITOR THE PROGRESS OF THE PROJECT AND TO IDENTIFY ANY PROBLEMS THAT MAY ARISE.
 3. **POST-CONSTRUCTION INSPECTION**: TO BE CONDUCTED AFTER THE PROJECT IS COMPLETED TO EVALUATE THE EFFECTIVENESS OF THE EROSION CONTROL MEASURES AND TO IDENTIFY ANY AREAS THAT MAY REQUIRE FURTHER WORK.

Soil Protection Chart

Soil Type	Soil Loss (ft)	Soil Loss (in)	Soil Loss (mm)
CLAY	1.0	12.0	300.0
SILT	0.5	6.0	150.0
SAND	0.2	2.4	60.0
GRAVEL	0.1	1.2	30.0

- Legend**
- 1. **ASPHALT PAVING**
 - 2. **CONCRETE PAVING**
 - 3. **GRAVEL PAVING**
 - 4. **SOIL LOSS**
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- Construction Sequence and Responsible Contractor**
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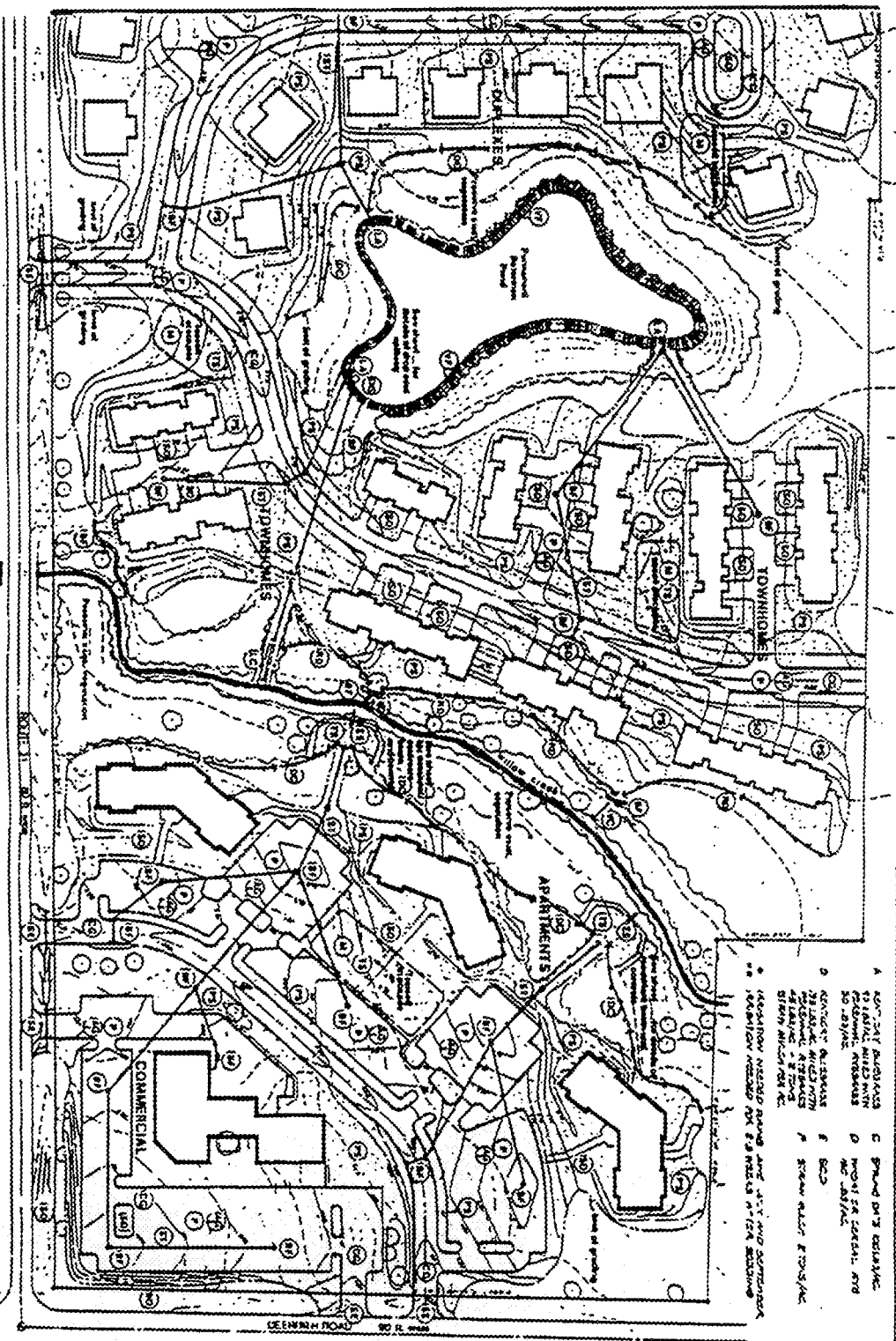


FIGURE A-3 WATER MANAGEMENT, EROSION AND SEDIMENT CONTROL PLAN